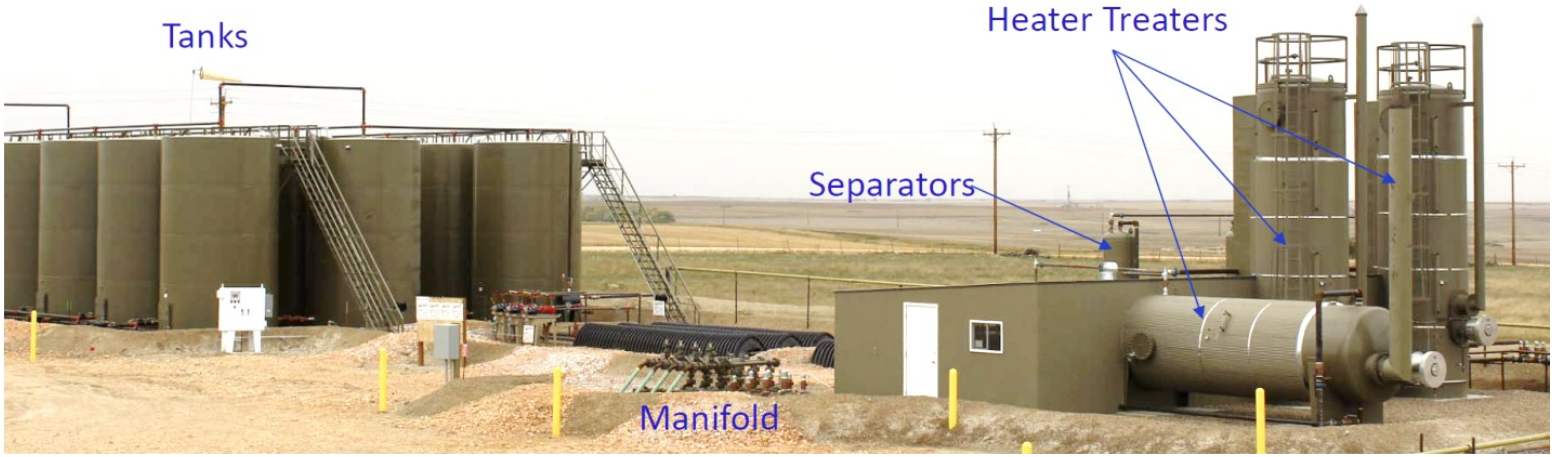
New Technologies for Safe and Cost Effective Oil Conditioning in North Dakota

Darren Schmidt, P.E.

5/9/2106

Background – Order 25417 Oil Conditioning Standards

- All wells must produce through a gas-liquid separator and/or emulsion heater-treater.
- Treaters, less than 50 psi & greater than 110°F.
- If operating > 50 psi, a vapor recovery system is required upstream of the oil storage tanks.
- If equipment other than specified above is used, a RVP of 13.7 psi must be demonstrated



Lord, D.; Luketa, A.; Wocken, C.; Schlasner, S.; Aulich, T.; Allen, R.; Rudeen, D.; "Literature Survey of Crude Oil Properties Relevant to Handling and Fire Safety in Transport" Sandia Report, March 2015.

Statoil

Project Drivers

- Heater treaters can blow out during windy conditions requiring increased attention to maintain operating temperature.
- In some cases, oil conditioning equipment is operated at temperatures of over 150°F to meet pipeline requirements for RVP, resulting in lost liquid volume.
- Various midstream operators have defaulted to an RVP of 13.7 psi.
- It has been demonstrated in the field that RVP can increase in tanks where oil is allowed to cool. Small volumes of light ends in tank head space can increase the RVP of the oil when allowed to condense in storage during cold winter weather.
- Costs
  - Added transportation $2-$5/bbl
  - $0.20 - $1.00 per bbl can be lost by volume reduction of oil based on vaporization of light ends
  - $1500 per day field testing RVP

Goals and Objectives

- Goal - provide technical solutions that address challenges relative to meeting RVP requirements for Bakken crude oil.
- Objectives
  - Provide a technical and scientific understanding of vapor pressure behavior in oil conditioning operations through modeling treating and storage equipment.
  - Improve the reliability and decrease the cost of crude oil conditioning at the wellhead by investigating the feasibility for sonic separation.
  - Decrease the costs associated for conditioning high RVP crude oil by investigating chemical treatment options.

Methodology

- Task 1 – Modeling
  - Deliverable: Report highlighting modeling results for surface oil conditioning, regained RVP from storage, and opportunities to control RVP relative to light end component composition
- Task 2 – Sonic separation
  - Deliverable: Laboratory report of results from sonic separation of Bakken wellhead fluids, and identification of a commercial partner to field demonstrate new technology. The intent is to develop a technology that is not influenced by cold weather or windy conditions.
- Task 3 – Chemical treatment
  - Deliverable: Identify chemical options that meet downstream requirements and can be economically applied to volumes of oil that require lowering RVP.

Budget

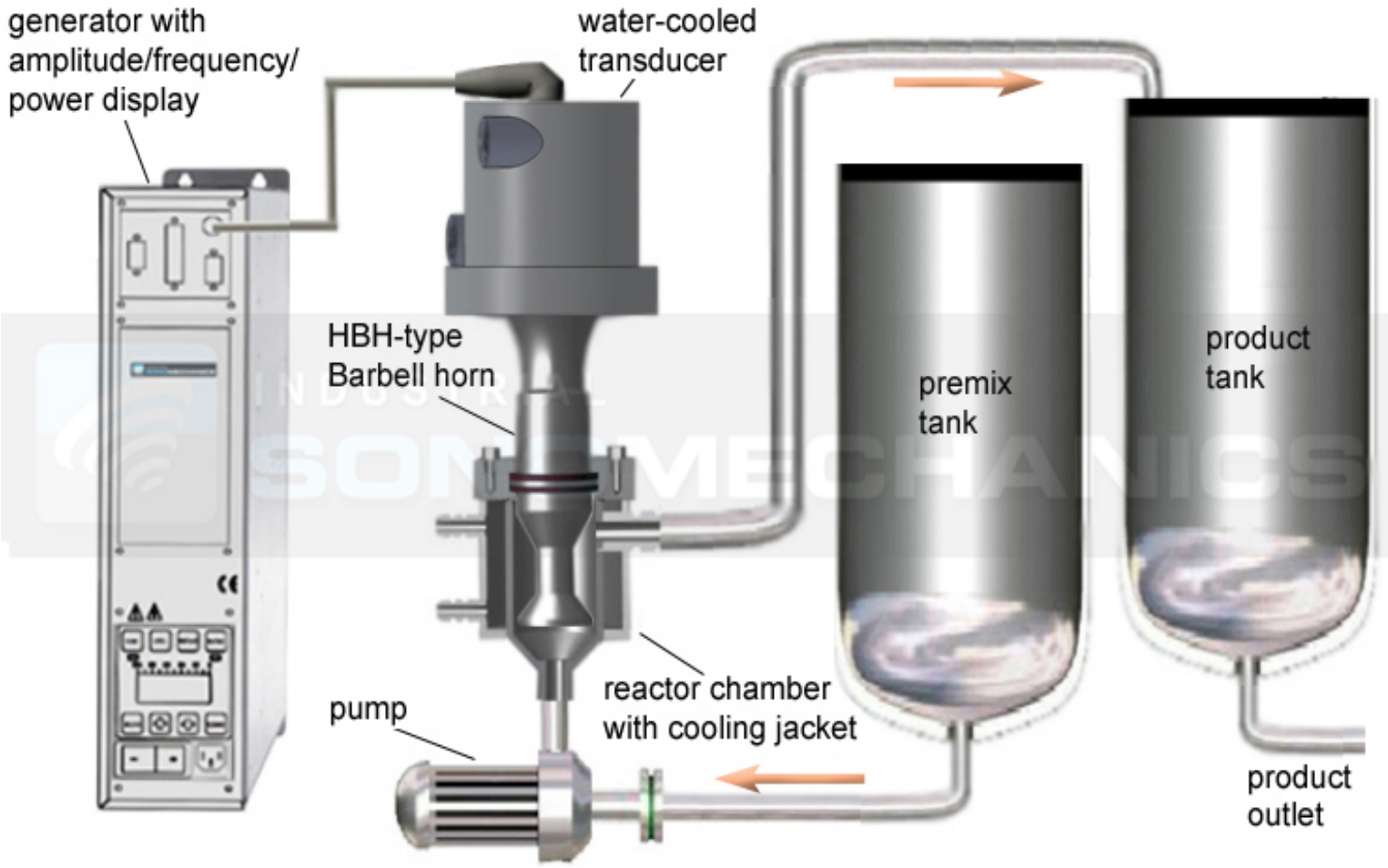
Project Associated Expense	NDIC's Share	Applicant's Share (Cash)
Task 1 - Modeling	$32,258.07	$12,903.23
Task 2 - Sonic Testing & Development	$64,516.13	$38,709.68
Task 2 - Lab Subcontract		$100,000.00
Task 3 - Chemical RVP Treatment	$32,258.07	$12,903.23
Indirect Costs	$70,967.74	$35,483.87
Total Project Costs	$200,000.00	$200,000.00

Timetable

	2016			2017			
	June	August	November	January	March	May	
Task 1 - Modeling							
Deliverable		Report provding mass balance of light ends around wellhead equipment					
Task 2 - Sonic Separation & Dev.					& ambient temperature influences.		
Establish subcontract							
Complete lab experiments							
Report & plan forward w/ field test							
Note: if unsuccessful; decision gate is to explore other technologies such as VRU based options, and other mechanical solutions.							
				Decision gate for Task 2			
Task 3 - Chemical RVP Treatment							
laboratory work							
Field test							
Reporting							
Decision gate: At the conclusion of the laboratory work, costs will be assessed to determine if an economic application is possible.							
			Decision gate for Task 3				
Final project report							

Ultrasonic Degassing (hielscher.com) - YouTube

Statoil


generator with
amplitude/frequency/
power display
water-cooled
transducer
HBH-type
Barbell horn
premix
tank
product
tank
reactor chamber
with cooling jacket
pump
product
outlet

CALFRAC

Where People and Technology Meet

SlikPro®
Slick Oil Fluid System

Loadings

Product	Description	Country	Typical Loadings 30°C-120°C 85°F – 250°F (L/m^3)
DHP-201	Hydrocarbon Gellant	Canada	3.0
		US	3.0 gpt
DHP-202	Hydrocarbon Activator	Canada	1.0
		US	1.0gpt
DHP-903	Hydrocarbon Breaker	Canada	1.0
		US	1.0gpt

NOTE: DHP-903 MUST be added **FIRST** and DHP-201 MUST be added **LAST**

Statoil

There's never been a better time for good ideas

New Technologies for Safe and Cost Effective Oil Conditioning in North Dakota

Darren Schmidt
Completions Engineer
dschm@statoil.com
Tel: (701) 739-5680

www.statoil.com

Statoil